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Special Investigation Report: Evacuation of United Airlines DC-8-61, Sky Harbor International Airport, Phoenix, Arizona December 29, 1980

(U.S.) National Transportation Safety Board
Washington, DC

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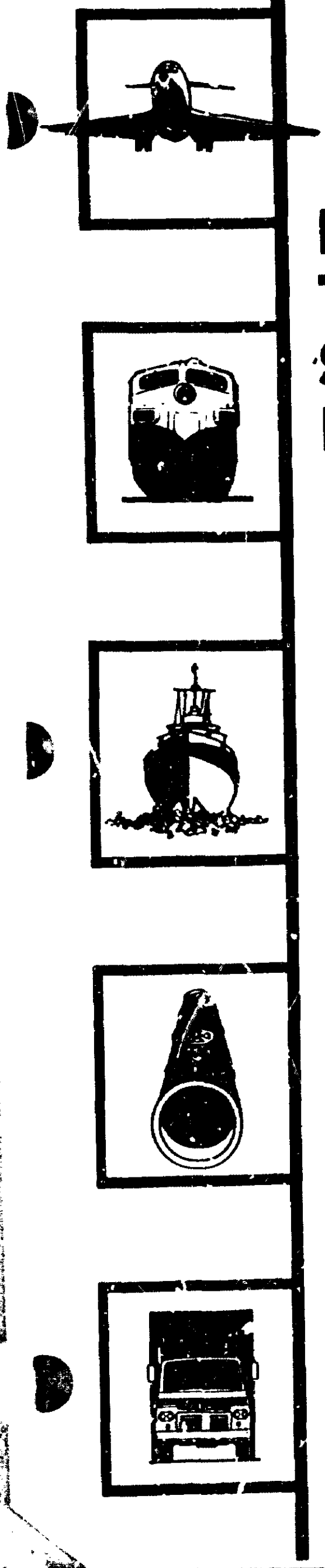

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

SPECIAL INVESTIGATION REPORT

EVACUATION OF UNITED AIRLINES DC-8-61, SKY HARBOR INTERNATIONAL AIRPORT, PHOENIX, ARIZONA, DECEMBER 29, 1980

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16. Abstract

On December 29, 1980, United Airlines Charter Flight 5820, a DC-8-61, with 238 passengers and a crew of 9, was evacuated at Sky Harbor International Airport, Phoenix, Arizona, when the failure of the rear landing gear bogie beam resulted in a fire in the aircraft's right main landing gear. The cockpit crew was erroneously advised of an engine fire by the airport tower and began emergency shutdown procedures. The captain initiated the evacuation after all electrical power had been shut down and the public address (PA) and cabin interphone systems were without power. Therefore, the second officer had to give the evacuation orders to passengers and flight attendants by "word of mouth." During the evacuation, no other emergency communication equipment was used; the flightcrew used only verbal, unamplified commands.

As part of the National Transportation Safety Board's special investigation of the evacuation, a questionnaire was sent to all passengers. In response to the questionnaire, a majority of passengers commented that communication between flight personnel and passengers was ineffective and confusing and caused the evacuation to be delayed. As a result of its special investigation and its previous work on the subject of evacuations, the Safety Board has made recommendations to the Federal Aviation Administration (FAA) to improve the availability of emergency communication equipment and to promote its use.

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INTRODUCTION

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INVESTIGATION

Accident Summary

About 1718 mountain standard time, on December 29, 1980, United Air Lines Charter Flight 5820, a DC-8-61, 1/ prepared to depart Sky Harbor International Airport in Phoenix, Arizona, bound for Columbus, Ohio. The airplane was chartered by an Ohio State University Alumni group. On board the aircraft were 238 passengers and 9 flightcrew members. The aircraft was taxiing west of taxiway B for departure on runway 8L when the bogie assembly structure for the right gear truck broke, causing the right strut to collapse. The strut, leaking hydraulic fluid, dragged on the taxiway for about 390 feet. (See figure 1.) Sparks from the dragging strut caused the hydraulic fluid and the right inboard front tire to catch fire; the tire blew out shortly thereafter.

The landing gear was damaged substantially, and the fuselage located directly above the landing gear was burned and blackened. Deceleration forces were low and did not cause any seat or seatbelt failures. During the evacuation, 2 passengers were injured seriously and 24 passengers were injured slightly. (See figure 2.)

1/ The NTSB investigation of this accident is continuing. The accident brief and the probable cause will be issued at a later date.

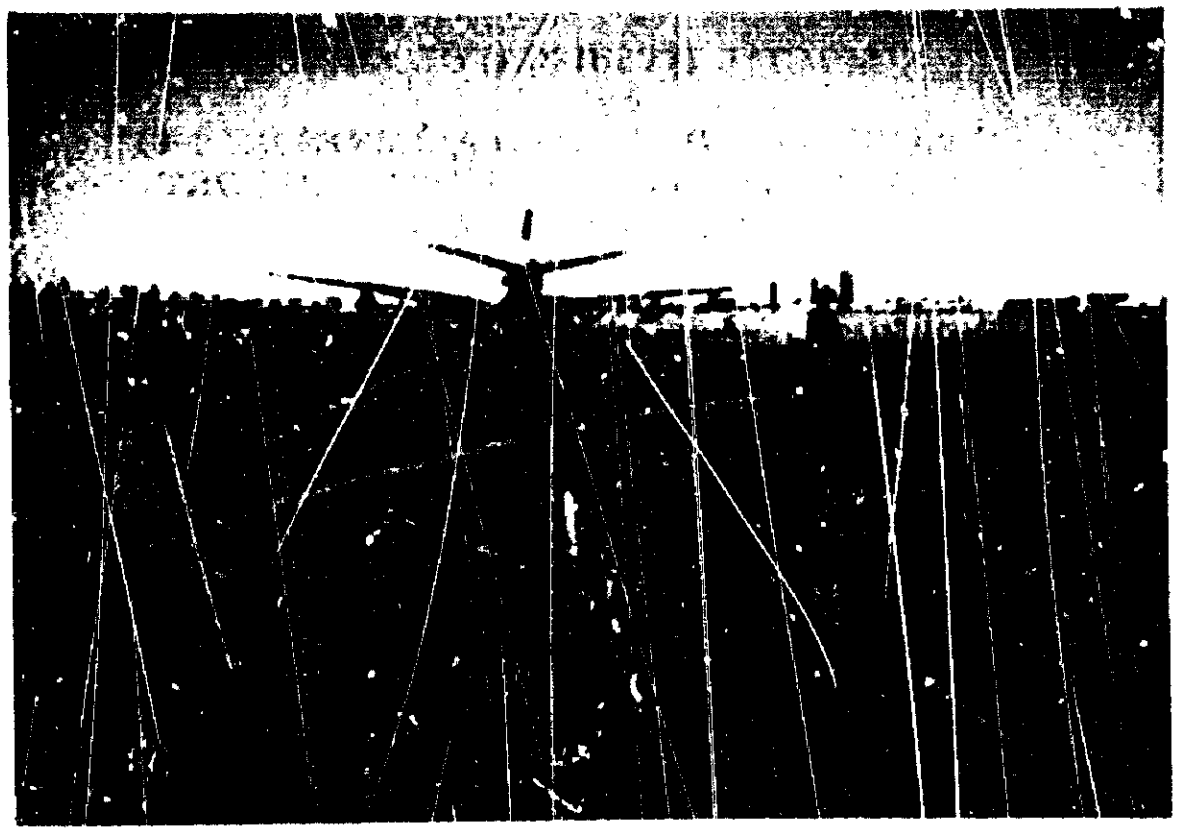


Figure 1.--Skid mark left by United Airlines DC-8 as strut dragged on taxiway.

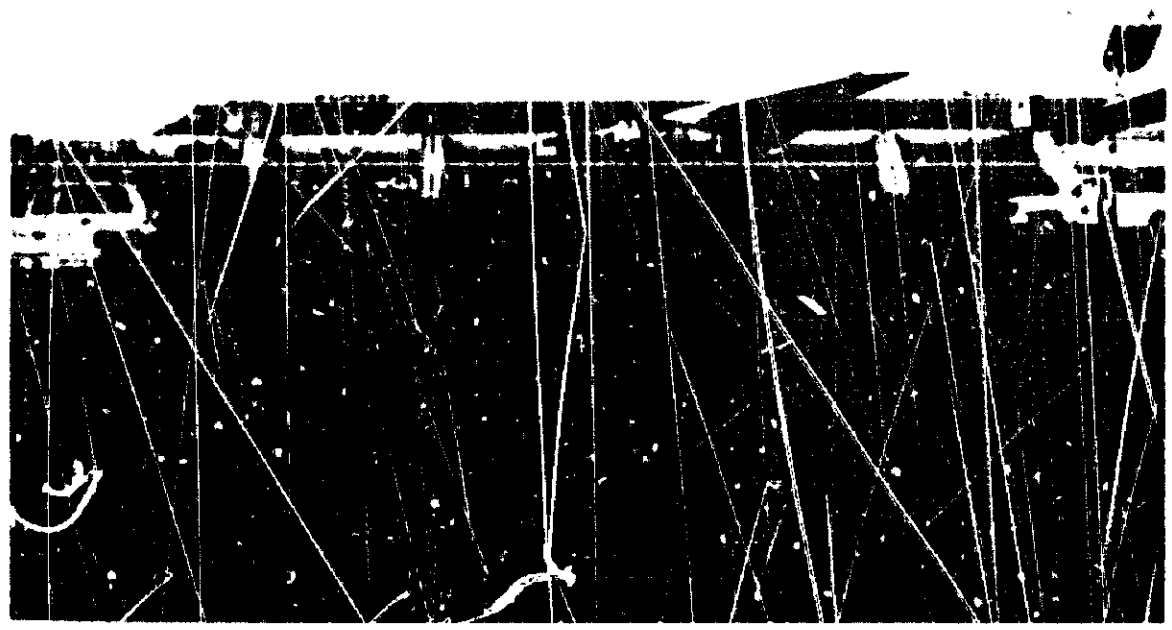


Figure 2.--Postevacuation view of the left side of the United Airlines DC-8 photographed by a passenger after he exited the aircraft with his camera.

Evacuation

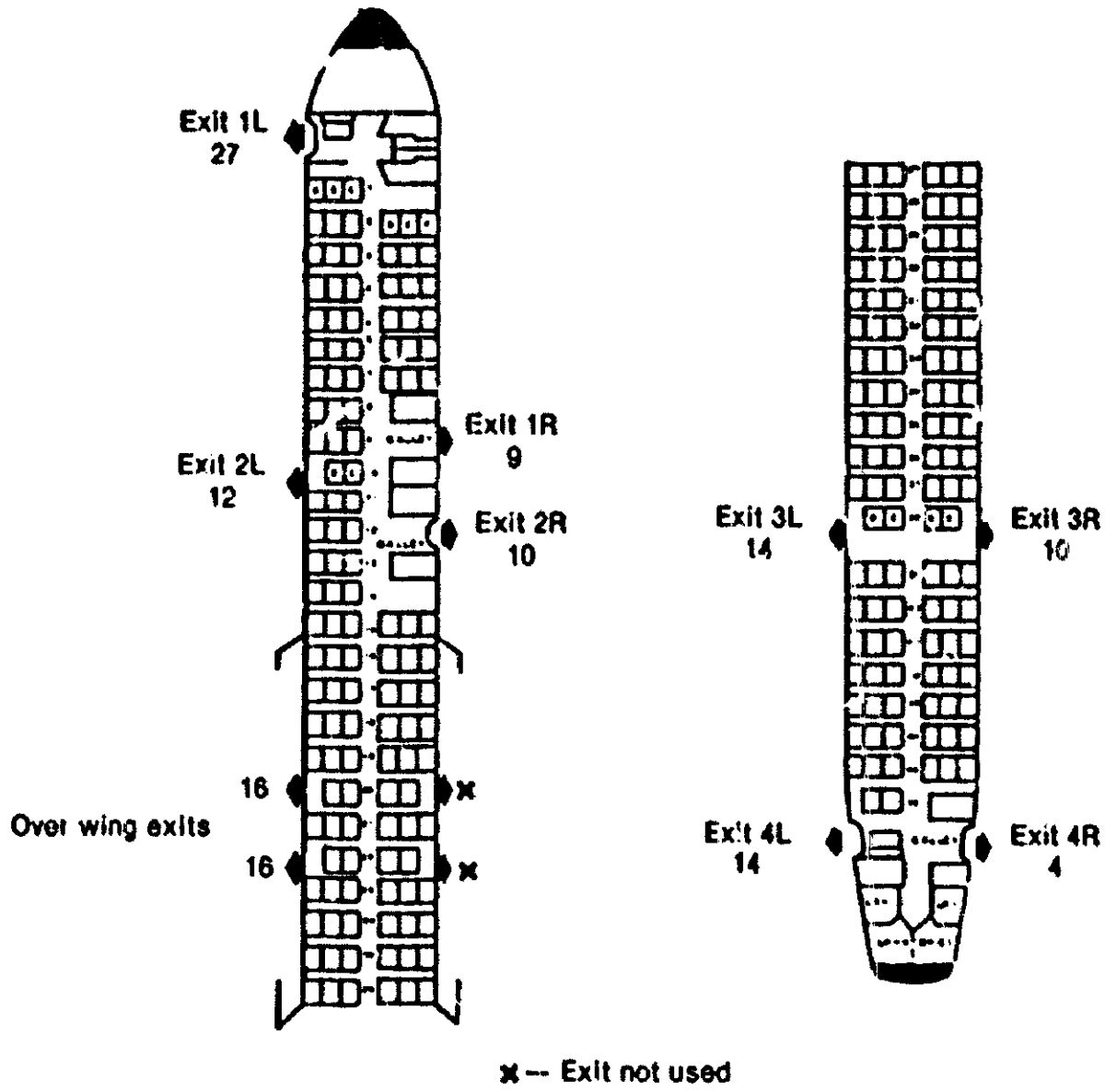
Shortly after the bogie assembly collapsed and a fire started in the landing gear, the airport tower erroneously told the flightcrew that they had an engine fire. The captain, following the emergency procedures for an engine fire, shut down the engines which in turn caused the shutdown of the electrical generating system. As the captain finished the engine fire checklist procedures, he directed the first and second officers to evacuate the aircraft. Since all the regular electrical power had been shut down, the PA and interphone systems were without power, and these emergency communication systems could not be used to initiate the evacuation. As a result, the order to evacuate was not given immediately when the aircraft stopped moving. Various passengers, depending on their seat location, estimated that it was about 1 to 3 minutes after the aircraft came to rest before the evacuation was ordered.

The evacuation of passengers began when the first and second officers entered the passenger cabin and shouted for passengers and flight attendants to evacuate the aircraft. The first officer and the senior flight attendant opened exit 1L on the left side of the aircraft and deployed the inflatable evacuation slide. (See figure 3.) At this time, smoke entered the cabin through the open exit. When the slide became fully inflated, the first officer deplaned through this exit. Shortly thereafter, exit 1R was opened. As passengers left the plane, the first officer helped direct the evacuation from outside of the aircraft. Meanwhile, the second officer made his way down the cabin aisle, directing flight attendants to open their exits and evacuate the aircraft. He eventually reached the area in the cabin where the overwing exits were located.

When the evacuation was started in the forward part of the cabin, many of the flight attendants and passengers seated in the middle and rear sections of the cabin were unaware that an evacuation had been directed. The flight attendants in these areas commented that many of the passengers shouted when they felt the jolts and when the aircraft stopped. Other passengers got out of their seats and reached for personal belongings from overhead bins. The flight attendants tried to restore order by shouting to passengers to "remain seated" and "stay calm." There was a further delay of about 1 minute before the flight attentants in the middle and rear cabin realized that the evacuation had begun in the forward cabin. One flight attendant seated in the aft section of the cabin gave the following observations of the delay:

> I looked forward and saw people getting out of their seats; however, still having seen nothing unusual, [I] assumed it was flat tires and told people in my area not to panic. Now I have found out that the front doors had been opened but because there was neither a signal nor alarm, [I] did not realize the evacuation had begun. My vision was blocked by the people standing in their seats which was still a full 10 to 12 rows in front of my exit. (Number 5 flight attendant, Row 39, Seat A.)

After many passengers in the front of the aircraft had been evacuated, flight attendants in the rear and middle cabin reported hearing a male voice shouting "open the exits" and "get out." At this time, the flight attendants in the middle and aft cabin began the evacuation of passengers. However, some passengers seated in these areas later reported that they never heard the orders to evacuate. They began leaving the aircraft through exits after it became apparent that many of the passengers in front of them had already deplaned.



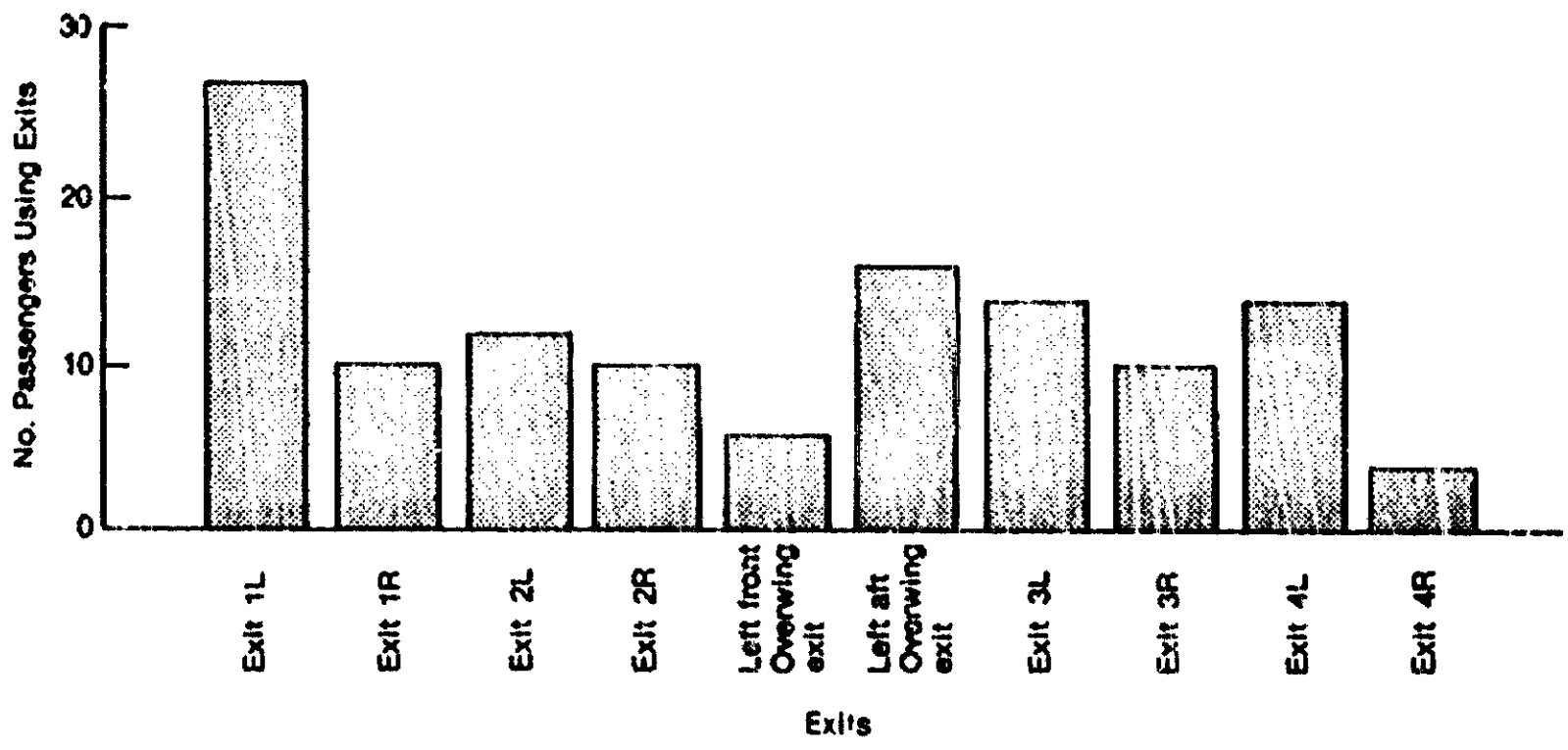


Figure 3.
Depiction of exit utilization of the United Airlines DC-8 which was reported by 122 of the 148 passengers who responded to the passenger questionnaire.

Once the evacuation was fully underway, flight attendants had opened 10 of the 12 exits; the 2 right-side overwing exits remained closed. The flight attendant assigned to the right-side overwing exits originally opened one of these exits, but upon seeing flames and smoke through the open exit, she decided that the exit was unusable and closed it. Flight attendants had some difficulty opening exits 3L and 4R. A passenger had to assist a flight attendant in opening exit 3L, while the flight attendant assigned to open exit 4R had to obtain assistance from another flight attendant. (See figure 3.)

Flight attendants, unaware that the PA and interphone systems were inoperative, tried to use these systems at least twice. The first attempt came shortly after the aircraft had stopped when a flight attendant in the front of the plane picked up the cabin interphone handset and attempted to use it. Observing her actions, the No. 2 flight attendant realized that the aircraft's electrical power was off. A second flight attendant who attempted to use the PA interphone system after the evacuation had already begun commented:

> I had evacuated the forward part of the cabin when I noticed a crowd of people at the buffet. I tried to use the PA system again but it was still dead. So I ran back by Ron [second officer] and yelled for people to come forward.

A further attempt to use another emergency communication device failed when two flight attendants were unable to remove one of the aircraft's cabin megaphones from its stowage bracket. After most of the passengers had left the plane, one of the flight attendants tried to remove the forward cabin megaphone from its brackets. Another flight attendant helped her but even their combined efforts failed to free the megaphone. After the futile attempt, both flight attendants deplaned through exit 1L. The brackets holding the megaphone were later found to be functioning properly.

Injuries

The 2 serious injuries and the 24 minor injuries resulted from the evacuation. The two serious injuries were sustained on the inflatable evacuation slides. One passenger was seriously injured as he deplaned from exit 1R with two overcoats in his arms. About halfway down the slide, his legs became tangled, and he fell off the slide and was knocked unconscious when his head hit the pavement. Other passengers dragged him away from the aircraft. He sustained a concussion and fractures of his jaw and wrist. Another passenger was seriously injured while exiting from a slide; he sustained a bilateral fracture of the right ankle. The minor injuries consisted mainly of cuts, bruises, and sprains. Seven passengers who used the overwing exits were injured as they jumped from the wing. Since the flightcrew was not able to fully lower the flaps because of engine shutdown, the drop from the wing to the pavement was about 7 feet. All of the other minor injuries were sustained by passengers using evacuation slides.

Following the evacuation, flightcrew personnel circulated through the crowd to check for injuries while waiting for rescue personnel to arrive. The fire in the landing gear tires was extinguished by line personnel while the evacuation was in progress. The fire department arrived about 2 minutes after the tower observed the fire.

Evacuation Filming

The crew of an airborne helicopter from a local television station, who were over downtown Phoenix and were monitoring the tower controller's conversation with the

United Airlines flightcrew about the fire,2/ videotaped the aircraft from shortly after it had come to a stop on the taxiway through the end of the evacuation. The videotaping began about 5 miles from the scene and ended after the helicopter had landed near the right side of the DC-8. The videotape showed that after the aircraft had come to a stop, a considerable amount of smoke was directly in front of the DC-8. (See figure 4.) The first evacuation slide to be deployed on the right side of the aircraft was from exit 1R. Shortly thereafter, the slide at exit 2R deployed. Passengers began evacuating through these exits as soon as the slides were inflated.

The slides at exit 3R and exit 4R were seen on the film to deploy about 65 seconds after the front slides had been deployed. The delay in deployment of these slides is consistent with the flight attendants' and passengers' statements that the initial evacuation orders were not heard in the rear of the aircraft and that most of the passengers in the front of the cabin had already left the aircraft before other passengers began evacuating. By timing the film footage, the Safety Board found that about 2 minutes 2 seconds elapsed between deployment of the first slide at exit 1R and evacuation of the last occupant on the right side of the plane. The left side of the accident aircraft was not videotaped because the helicopter approached and landed on the right side of the aircraft. Therefore, the timing of the deployment of the evacuation slides on the left side of the aircraft could not be established. The senior flight attendant later stated, however, that the first slide to be deployed was on the front left side of the aircraft, which suggests that the evacuation had begun on the left side of the aircraft before the right-side slides were deployed. With this information and the knowledge that some time elapsed before the flightcrew began the evacuation, the Safety Board estimated that the total time for evacuation of the aircraft was about 2 1/2 minutes from the time the 1L exit was opened to the time the last passenger evacuated through exit 4R. Considering that, according to the passenger statements, the evacuation was not ordered until about 1 to 3 minutes after the aircraft had stopped, this evacuation time clearly exceeded the 1 1/2-minute limit set by the FAA for aircraft certification; 14 CFR 121.291 requires that operators of aircraft with a seating capacity of more than 44 passengers used in passenger-carrying operations must demonstrate that the aircraft can be totally evacuated in 90 seconds (1 1/2 minutes) or less.

Passenger Statements

The Safety Board sent questionnaires to the 238 passengers on board the DC-8 to solicit their observations of the incident in order to assess the adequacy of existing safety standards; 148 passengers responded to the questionnaire.

A majority of the responding passengers expressed the view that flightcrew personnel had difficulty starting the evacuation and maintaining leadership as passengers left the plane. Communications difficulties between flightcrew personnel began when the aircraft engines were shut down, rendering the PA and interphone systems inoperative. Many passengers, hearing a variety of verbal orders from flightcrew personnel, commented that they were unsure whether to evacuate or remain seated. This confusion resulted because cabin attendants in the middle and aft sections of the plane ordered passengers to remain seated and belted in, while flight attendants and flightcrew personnel in the forward section were ordering an evacuation. Other passengers, seeing the fire and smoke in the landing gear and wing areas, began to evacuate on their own initiative. However, when flight attendants told them to sit down and remain calm, these passengers at least initially complied. Still other passengers commented later that they

2/ KPNX Broadcasting Company, 1101 North Central Avenue, Phoenix, Arizona 85001.

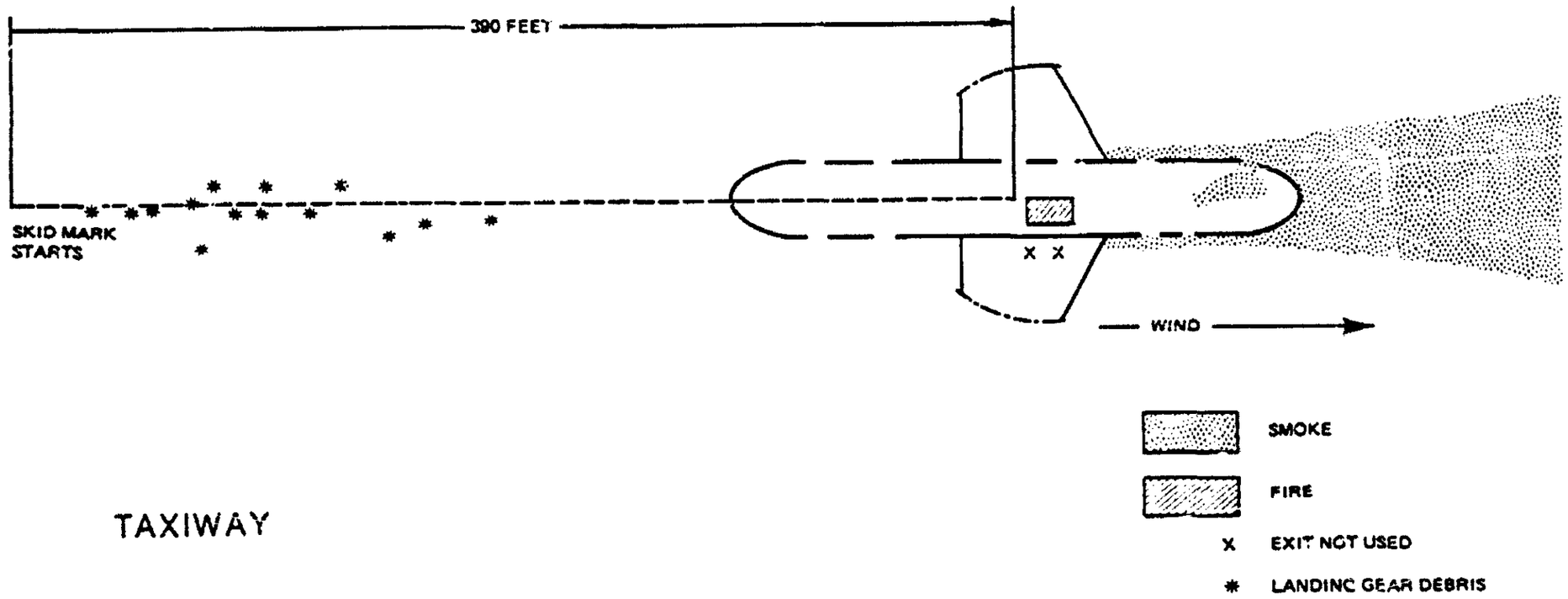


Figure 4.—Path and final position of United Airlines DC-8.

only heard the "remain seated" and "stay calm" orders from flightcrew personnel, and that they ultimately evacuated on their own initiative when it became obvious that the forward part of the aircraft had been evacuated. Of the 148 passengers responding to the questionnaire, 82 commented that a communications problem existed during the evacuation; 27 of the 82 also recommended that a dependable communications system should be available so that the problems experienced during this evacuation might be avoided in the future. The following passenger statements were extracted from the questionnaires and illustrate the communications problems during the evacuation:

Row 2, Seat E

The stewardess in our part of the plane took charge. However, when it was certain the plane was on fire, we were told to go back to our seats. At that point, there was a lot of confusion. Once the plane stopped, we sensed a lot of uncertainty. It was as though we were cut off and really didn't know what the situation was.

Row 5, Seat A

The most disturbing factor in this incident (other than the malfunction of the plane) was the variety and directly opposite instructions from the plane personnel. 'Evacuate.' 'Remain seated.' 'Evacuate.' 'Move to the right side of the plane,' and finally, 'Evacuate' again.

Row 7, Seat E

In talking with the other passengers, I learned that the flight attendants in the back of the plane were keeping the passengers seated while we in the front had already been evacuated. Apparently, they did not hear the shouted order to evacuate.

Row 13, Seat B

The poor flight attendants received no instructions from the pilot. The PA system had been turned off. They were telling us to keep our seats and keep calm when all the smoke and flames could be seen from our window. We knew we had to evacuate.

Row 17, Seat A

Took longer than should have to be told to evacuate--when power was shut off-- PA system was turned off too--all stewardesses ran to cockpit for instructions then had to return to their doors and open them. Took more time than if PA system had conveyed evacuation command. Need PA system that operates free of the standard power system.

Row 18, Seat F

I saw or heard nothing from any attendants or crewmember after the plane stopped and several stewardesses yelled several times, 'Stay in your seats'. After that, no one told us anything at all and we made our way to the exit on our own initiative.

Row 24, Seat B

Our stewardess ran up the aisle and yelled for us to stay seated, and then she never came back. We looked out and saw people from the front evacuating and running from the plane so we got our own exit opened and got out without the assistance of any crewmember.

Row 25, Seat F

They were as unprepared as the rest of us for the accident as there was no warning--initially they kept everyone in their seats in my location. To the rear they did not let us leave the aircraft while it was obvious the forward section was evacuating the plane. They did not handle themselves well. Once on the ground, they did much better in getting the passengers organized.

Row 26, Seat A

Initially, we could see fire burning out the right side window next to the wheels. Some smoke appeared to come into the cabin. There were no directions from the PA system. People were standing and trying to rush to the exits. Some shouted 'Sit down.' The stewardesses seemed very fearful--not knowing what to do. Because tumult with everybody shouting, talking, it was impossible for the crewmembers to shout over the noise. No one made use of the PA system. Everyone was for himself. The lack of direction contributed to the chaos.

Row 27, Seat F

When I heard the explosion and immediately saw the fire at the right wing along the rear edge of the wing I turned to my wife in the seat to my left and told her this plane is on fire. We've got to get off now. The lady in the aisle seat didn't know we were on fire. The two stewardesses in the rear of the plane didn't know we were on fire. Somebody said they were listening to the tower on their head set when the aircraft stopped and the tower said 'United 5820 shut down; you have a fire on the right side.' The pilots came out of the cockpit and opened the left front door and said 'Come on, get out of here.' The pilots left. The front 15 rows went out. Our two stewardesses in the back kept saying, 'Sit still, keep calm, don't panic.' I told my wife if it got hot on our feet we were going out of there. We sat still for about 2 minutes and a stewardess in row 20 yelled 'Hurry, get out of here; evacuate'. This was a long delay and if that fire didn't go out, maybe the last delay.

Row 29, Seat C

They [flight attendants] stood in the aisle and yelled 'Sit down, don't panic,' I believe they said this at least three times. The passengers finally decided we had to get out of our seats and out of the aircraft. I never heard an attendant say anything other than 'sit down,' or 'don't panic.'

Row 34, Seat F

Evacuation order could not come from cockpit because power was off when evacuation started. Flight attendant [rear] held up evacuation of rear of aircraft. Saw helicopter overhead before we were permitted to evacuate. The delay in evacuation of the aircraft could have caused a disaster. This

delay was the big goof of the day. An aircraft on fire [still on the ground] should be evacuated immediately. This one was not evacuated immediately.

Row 38, Seat C

The most significant aspect of the accident was when the power was cut off due to the fire. It eliminated communication from the pilot to his crew and passengers. The shock was there was no battery unit so pilot could communicate evacuation and all could hear.

Emergency Communication Equipment Requirements

As a part of its special investigation, the Safety Board reviewed its past accident reports, special studies, special investigation reports, and recommendations relating to emergency communications equipment. The 1974 Safety Board study, "Safety Aspects of Emergency Evacuations from Air Carrier Aircraft," 3/ noted that megaphones, evacuation alarms, and PA systems are emergency communication devices which can be used during an emergency.

Megaphones.—In evacuations, megaphones can provide flight personnel with voice amplification to direct passengers as they exit the plane. Current Federal Aviation Regulations require that aircraft with seating capacities of more than 60 and less than 100 pasengers have one megaphone easily accessible to a flight attendant at the most rearward location in the passenger cabin. Airplanes with seating capacities of more than 99 passengers must have two megaphones easily accessible to flight attendants; one at the forward end and one at the rearmost location in the passenger cabin. (Deviations can be granted by the FAA when a different location is demonstrated to be more useful for the evacuation of persons during an emergency.)

Under these regulations, the United Airlines DC-8 was required to have available, and had available, two megaphones located in overhead storage bins; one at the front and one at the rear of the passenger cabin. The forward flight attendant or one of the flightcrew should have used the megaphone to initiate the evacuation; this would have averted much of the passenger confusion. Only after the plane had been almost completely evacuated did flight attendants make any attempt to remove the megaphone from its stowage bracket in the forward cabin.

The 1974 Safety Board study noted that even though megaphones are required in the passenger cabin, they rarely if ever are used in evacuations. In fact, megaphones were not used in any of the 10 accident/evacuations cited in the Safety Board report.

Crewmember emergency training regulations are addressed by the FAA in 14 CFR 121.417. (See appendix A.) Crewmembers must perform emergency drills during initial training and thereafter every 24 months during recurrent training utilizing such emergency equipment as fire extinguishers, oxygen systems, and evacuation slides. However, the regulations do not mention training drills or actual operation of megaphones. In view of the rare use of megaphones in past evacuations and the unsuccessful attempt to use the megaphone in this evacuation, the Safety Board believes that the FAA should require the use of megaphones be included in crewmember emergency training.

3/ Aviation Special Study: "Safety Aspects of Emergency Evacuations from Air Carrier Aircraft," November 13, 1974. (NTSB-AAS-74-3.)

Evacuation Alarm Systems.—The evacuation alarm is another emergency communication device that can be used during evacuation situations. However, the United Airlines DC-8 did not have such an alarm system installed nor was it required to be installed.

In 1972, the Safety Board recommended that the FAA require evacuation alarms be installed in all air carrier aircraft (Safety Recommendation A-72-141). The recommendation was prompted by the investigation of the evacuation of a Pan American World Airways Boeing 747 in San Francisco, California, on July 30, 1971. 4/ The B-747 was forced to land after receiving substantial damage upon takeoff after contacting the approach lighting system structure. After the aircraft had landed and upon the flightcrews' seeing a fire in the area of the wing landing gear, the flightcrew ordered an evacuation. The first officer attempted to initiate the evacuation, but he inadvertently made the evacuation announcements over the radio instead of over the PA system. However, even if he had attempted to transmit the evacuation order over the PA system, the message could not have been completed because the captain and the flight engineer had shut down the aircraft systems, including electrical power.

The first officer and second officer entered the passenger cabin, from the flightdeck expecting to see the evacuation in progress, but passengers and flight attendants were still in their seats. The first and second officers then shouted to the passengers and flight attendants to evacuate the plane. Those cabin crewmembers who did not hear the shouted order to evacuate began evacuation procedures only after seeing the front exits open and aircraft occupants departing. These actions led to the sequential openings of exits from the front to the rear which delayed the evacuation considerably.

In view of the difficulties experienced during this evacuation, the Safety Board on August 23, 1972, recommended that the FAA:

> Require all air carrier aircraft to be equipped with an audio and visual evacuation alarm system. This system should be capable of being activated in the cockpit and at each flight attendant station. The alarm system should be self-powered so that interruption of the aircraft electrical systems will not interfere with use of the evacuation alarms. (A-72-141)

In response to the recommendation, the FAA agreed that an independently powered system was needed to initiate evacuations. However, action was not taken because the FAA believed that further study was required to determine the most practical and effective means of installing and utilizing such a system.

Although some air carrier aircraft are currently equipped with evacuation alarm systems, current Federal Aviation Regulations do not require the installation or use of evacuation alarms and the Safety Board is not aware of any comprehensive studies on the subject. The Safety Board believes strongly that the FAA should require the installation of an independently powered evacuation alarm in passenger-carrying aircraft.

Public Address Systems.—The PA system also is an effective communications device in an emergency. Current Federal Aviation Regulation 14 CFR 121.313 requires that aircraft with a seating capacity of more than 19 passengers be equipped with a PA system. In normal flight operations, the PA system is used regularly to brief passengers

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4/ "Aircraft Accident Report--Pan American World Airways, Inc., Boeing 747, N747PA, Flight 845, San Fransisco, California, July 30, 1971." (NTSB-AAR-72-17.)

and to keep them informed of the flight's progress; during emergency situations, it can be, and often is, used by the crew to inform passengers of procedures for dealing with the emergency.

Many emergency situations necessitating an evacuation often also necessitate that the engines be shut down, eliminating the normal source of electrical power and rendering the PA system powerless and useless. However, on some aircraft the PA system is wired directly to the battery bus and will remain operative after the engines have been shut down, if the battery switch is left in the "on" position.

In its 1974 Special Study, the Safety Board recommended that the FAA:

> Amend 14 CFR 121.318 to require after a reasonable date that public address systems be capable of operating on a power source independent of the main aircraft power supply. (A-74-111)

The study noted that the use of the PA system for emergency communications has become even more important with the advent of modern wide-bodied aircraft. The larger cabin areas and larger number of passengers increased the need for voice commands to be amplified so that evacuations can be controlled.

The Safety Board reiterated this recommendation after the crash of an United Airlines DC-8 in Portland, Oregon, on December 28, 1978. 5/ The PA system, which was powered by the main electrical generating system, became inoperative when engine power was lost because of fuel exhaustion. No preimpact warnings were given to the passengers via the PA system. Just before the aircraft struck the ground, the senior flight attendant who was talking into the handset realized that there was no power. Fortunately, other flight attendants looked outside, noted the airplane's proximity to the ground, and shouted to the passengers to assume the brace position. It is not known whether all passengers heard these warnings. In its report on the accident, the Safety Board stated that reliable communication is important to initiate and direct evacuations and to give preimpact warnings.

On January 19, 1981, the FAA issued Notice for Proposed Rulemaking No. 81-1 that complied with the intent of the Safety Board recommendation that a PA system capable of being alternatively powered from a source independent of the main electrical generating system be installed. (See appendix B.) The proposal stated that the PA system must be capable of operation from a power source independent of the main electrical generating system without jeopardizing the in-flight emergency electrical power system. The proposed requirement would be added to existing regulations concerning PA systems, and air carrier aircraft affected by the change would be required to comply within 2 years after the effective date of the amendment. The FAA proposal for PA systems is still pending with a final decision on rulemaking to take place in December 1981. The Safety Board commented favorably on this Notice of Proposed Rulemaking.

The FAA requested that specific comments and data be submitted either supporting or opposing the compliance date, along with the cost of retrofitting aircraft. The Air Transport Association (ATA) of America, whose members include many of the major airlines, responded to the FAA notice. ATA's response included replies from several of its member airlines. One of ATA's members, United Airlines, replied that currently four of its five aircraft types have PA systems which operate independent of the main electrical

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5/ "Aircraft Accident Report--United Airlines, Inc., McDonnell-Douglas, DC-8-61, N8082U; Portland, Oregon, December 28, 1978." (NTSB-AAR-79-7.)

generating system; the only one which did not comply was its DC-8's. Other airlines had various types of aircraft which did not comply. Estimates of retrofit costs ranged from $500 to $5,000 per aircraft and estimates of compliance time ranged from 2 to 3 years.

The Safety Board believes that, despite the wide range of cost estimates for this modification, the benefits of an operable PA system outweigh the economic burden required to accomplish this modification. Moreover, the Board believes that the compliance time of 2 years as stated in NPRM No. 81-1 does not seem unreasonably burdensome. The Notice containing the PA system modification proposal is still under review by the FAA; the Board urges that the final rule be adopted promptly.

Accident experience has illustrated that the cabin interphone system and alternate procedures are not adequate for maintaining communication in emergencies. On May 2, 1970, an Overseas National Airways DC-9 operating as Antilliaanse Luchtvaart Maatschappy Flight 980 ditched near St. Croix. 6/ The flight departed Kennedy International Airport, New York, with an intended nonstop destination to St. Maarten, Netherlands Antilles. The flightcrew made three circling approaches at the Juliana Airport, St. Maarten, but was unable to land due to the poor visibility caused by heavy rain showers, and the aircraft diverted to St. Croix. En route to St. Croix, fuel was exhausted, the engines flamed out, and the aircraft ditched. Forty persons including 35 passengers and 5 crewmembers were rescued; 23 persons including 2 infants and a stewardess did not survive.

Although the captain verbally instructed the purser to prepare the passengers for the ditching about 10 minutes before the crash, the PA system's cockpit microphone was inoperative, and as a result no direct instructions could be given from the cockpit. Since the same microphone also is used for the interphone system, the interphone system could not be used. The navigator was sent back to the cabin to assist with preparations for the ditching, which included helping the purser move the 25-man raft from the forward coat closet to the galley area of the cabin. A steward was also in the galley area securing the galley equipment when the navigator suddenly became aware that impact was imminent and shouted for everyone to sit down. The steward sat down on the raft, and the navigator and purser sat down in the aft-facing jumpseat on the forward cabin bulkhead. However, several passengers and a stewardess remained standing and at least five others did not have their seatbelts fastened at impact.

Later, at a Safety Board public hearing, the captain testified that the PA microphone was inoperative so he turned the seatbelt sign on and off to warn the passengers and cabin crew of the impending impact. In its accident report, the Safety Board concluded that fewer lives would have been lost if the passengers had been warned in time to strap themselves into their seats and prepare for the impact.

In 1976, the Safety Board examined the Master Minimum Equipment Lists 7/ (MMEL's) of several aircraft and found that certain inconsistencies regarding the PA system existed among various types of passenger-carrying aircraft. The MMEL's for the B-747 and B-707 required that the PA system must be operational from the flightdeck and at least one flight attendant station at all times. Other portions of the PA system could be inoperative for up to 25 flight-hours, but immediate repairs were required if the aircraft was at a station where repairs or replacement could be made. On the other hand,

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6/ "Aircraft Accident Report--Overseas National Airways, Inc., Douglas DC-9, N935F Operating as Antillaanse Luchtvaart Maatschappy Flight 980 Near St. Croix, Virgin Islands, May 2, 1970." (NTSB-AAR-71-8.)

7/ The MMEL's approved by the FAA contain a listing of aircraft equipment which must be functional for a flight to be dispatched.

the MMEL's for other aircraft such as the DC-9, DC-10, and B-727 allowed the PA system to be inoperative if the cabin interphone system was operative and alternate normal and emergency procedures and/or operating restrictions were established and utilized. The DC-10 was further required to have the left or right cabin handsets operative at the forward, mid, overwing, and aft attendant stations. The MMEL's for the DC-9, DC-10, and B-727 placed no time limit for repairs to be made. As a result of the inconsistencies in the MMEL's, the Safety Board recommended on August 13, 1976, that the FAA:

> Require that the MMEL's of passenger-carrying airplanes be standardized to require that the PA system be operable from the cockpit and from at least one flight attendant station at all times. (A-76-120)

Responding to the Safety Board's recommendation, the FAA standardized the MMEL's concerning PA systems so that the B-747 and B-707 now operate under the same stipulations as the DC-9, DC-10, and B-727. During this special investigation, the Safety Board examined the current MMELs for passenger-carrying aircraft and found that the provisions of 14 CFR 121.318, which require an operational PA system aboard airplanes with a seating capacity of more than 19 passengers, are being negated by the MMEL's. The FAA's action, which is totally contrary to the intent of Recommendation A-76-120, allows such passenger-carrying aircraft as the DC-8, L-1011, DC-9, DC-10, B-747, B-727, and B-707 to be flown with an inoperative PA system as long as the cabin interphone system is operative and alternate normal and emergency and/or operating restrictions are utilized. (See appendix C.)

The Safety Board believes that accident experience has demonstrated that the cabin interphone system is not an acceptable alternative to the PA system for initiating evacuation or for assisting passengers during evacuations. Like the PA system, the cabin interphone system can become inoperative in the event of electrical power shutdowns. In addition, during unanticipated evacuations, such as the United Airlines DC-8 evacuation, flight attendants are often not at their stations where interphones are located, but instead are attempting to assist excited passengers. The PA system, unlike the cabin interphone system, can provide the flightcrew with an immediate means for communication which can be heard by both passengers and flight attendants. The Safety Board concludes that inoperative PA systems on passenger-carrying flights can result in an unacceptable level of safety for aircraft occupants.

SUMMARY

The special investigation into the evacuation of 238 passengers from a United Airlines DC-8 on December 29, 1980, revealed an atmosphere of confusion and disorder among passengers and flight personnel that can occur when emergency communications devices are not used or are inoperative. During the evacuation, flightcrew personnel did not use the battery-powered megaphones to initiate the evacuation nor were they able to use the PA system since the engine power had been shut down. Hence, there was no means of communication between the personnel in the front of the cabin who ordered an evacuation and those flight personnel in other parts of the cabin who ordered passengers to remain seated. Although the majority of passengers escaped serious injury, had the fire in the wheel well suddenly spread, the breakdown of communication could have resulted in drastically reduced chances of occupant survival.

The Safety Board's past studies and accident reports have shown conclusively that megaphones, evacuation alarms, and PA systems are vital to a successful emergency evacuation, and it has made numerous recommendations to correct deficiencies. However, 10 years have elapsed, untold passengers' lives have been placed in jeopardy, and many serious injuries have occurred, and still the FAA has not acted to enhance one of the

most important aspects of postcrash survival in an aircraft accident-- an effective communication system required for the rapid and expedient evacuation of occupants.

This special investigation again shows clearly that crewmembers depend on the PA system to provide instructions more than on any other emergency communication device in an aircraft. It also shows clearly that the interphone system is no substitute for the PA system because it cannot serve to provide direct instructions to passengers. And finally, it is evident that, while the megaphone is a valuable piece of equipment that provides communication redundancy, crewmembers apparently are unaware of its usefulness, let alone how to remove it from stowage in the aircraft. Clearly, FAA and air carriers must emphasize this equipment in the emergency training provided crewmembers.

RECOMMENDATIONS

As a result of this special investigation, the National Transportation Safety Board has issued the following recommendations to the Federal Aviation Administration:

Amend 14 CFR 121.417 to include megaphones as a piece of emergency equipment which crewmembers must actually operate during initial training and recurrent training procedures. (Class II, Priority Action) (A-81-128)

Require the installation of an independently powered evacuation alarm system in passenger-carrying aircraft. (Class II, Priority Action) (A-81-129)

Promptly adopt the final rule as proposed in FAA's Notice of Proposed Rulemaking No. 81-1 -- to have the public address system on passenger-carrying aircraft capable of operating from a power source independent of the main electrical generating system without jeopardizing the in-flight emergency electrical power system. (Class II, Priority Action) (A-81-130)

Amend the MMEL's for passenger-carrying aircraft to require that the PA system be operable from the cockpit and from at least one flight attendant station at all times. These amendments should include provision that the aircraft may continue the flight or series of flights with other portions of the system inoperative for a reasonable number of flight-hours, but may not depart a station where repairs or replacements can be made. (Class II, Priority Action) (A-81-131)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ PATRICIA A. GOLDMAN
Member

/s/ G. H. PATRICK BURSLEY
Member

ELWOOD T. DRIVER, Vice Chairman, and FRANCIS H. McADAMS, Member, did not participate.

September 9, 1981

APPENDIXES

APPENDIX A

Crewmember Emergency Training Regulations

Title 14—Aeronautics and Space

§ 121.417 Crewmember emergency training.

(a) Each training program must provide the emergency training set forth in this section with respect to each airplane type, model, and configuration, each required crewmember, and each kind of operation conducted, insofar as appropriate for each crewmember and the certificate holder.

(b) Emergency training must provide the following:

(1) Instruction in emergency assignments and procedures, including coordination among crewmembers.

(2) Individual instruction in the location, function, and operation of emergency equipment including—

(i) Equipment used in ditching and evacuation;

(ii) First aid equipment and its proper use;

(iii) Portable fire extinguishers, with emphasis on type of extinguisher to be used on different classes of fires; and

(iv) Emergency exits in the emergency mode with the evacuation slide/raft pack attached (if applicable), with training emphasis on the operation of the exits under adverse conditions.

(3) Instruction in the handling of emergency situations including—

(i) Rapid decompression;

(ii) Fire in flight or on the surface, and smoke control procedures with emphasis on electrical equipment and related circuit breakers found in cabin areas including all galleys, service centers, lifts, lavatories and movie screens;

(iii) Ditching and other evacuation, including the evacuation of persons and their attendants, if any, who may need the assistance of another person to move expeditiously to an exit in the event of an emergency.

(iv) Illness, injury, or other abnormal situations involving passengers or crewmembers; and

(v) Hijacking and other unusual situations.

(4) Review and discussion of previous aircraft accidents and incidents pertaining to actual emergency situations.

(c) Each crewmember must perform at least the following emergency drills and (except with respect to the equipment specified in paragraphs (c)(6) (v), (vi), and (vii) of this paragraph) actually operate the following emergency equipment during initial training and once each 24 calendar months during recurrent training on each type aircraft in which they are to serve. Each crewmember is only required to participate in one emergency evacuation using a slide during initial training. (Alternate recurrent periods required by § 121.433(c) may be accomplished by approved pictorial presentation or demonstration.)

(1) Each type of emergency exit in the normal and emergency modes, including the actions and forces required in the deployment of the emergency evacuation slides.

(2) Each type of fire extinguisher.

(3) Each type of emergency oxygen system.

(4) Emergency evacuation including the use of a slide.

(5) Donning, use, and inflation of individual flotation means, if applicable.

(6) Ditching, if applicable, including but not limited to, as appropriate:

(i) Cockpit preparation and procedures.

(ii) Crew coordination.

(iii) Passenger briefing and cabin preparation.

(iv) Donning and inflation of life preservers.

(v) Removal from the airplane (or training device) and inflation of each type of life raft.

(vi) Transfer of each type of slide/raft pack from one door to another.

(vii) Deployment, inflation and detachment from the airplane (or training device) of each type of slide/raft pack.

(viii) Use of life-lines.

(ix) Boarding of passengers and crew into a raft or a slide/raft pack.

(d) Crewmembers who serve in operations above 25,000 feet must receive instruction in the following:

(1) Respiration.

(2) Hypoxia.

(3) Duration of consciousness without supplemental oxygen at altitude.

(4) Gas expansion.

(5) Gas bubble formation.

(6) Physical phenomena and incidents of decompression.

(Sec. 1111 of the Federal Aviation Act of 1958; 49 U.S.C. 1511)

[Amdt. 121-88, 35 FR 90, Jan. 3, 1970 as amended by Amdt. No. 121-133, 42 FR 18394, Apr. 7, 1977; Amdt. 121-144, 43 FR 22647, May 25, 1978; Amdt. 121-148, 43 FR 46234, Oct. 6, 1978; 44 FR 25307, Apr. 30, 1979]

APPENDIX B

Notice of Proposed Rulemaking No 81-1 Change Pertaining to the Public Address System

11-6. By amending §§ 121.309(f)(1) and (f)(2) by replacing the words "to a normal" with the words "from a required", by inserting, in § 121.309(f)(2) the phrase "and less than 200" between "99" and "passengers", and by adding a new § 121.309(f)(3) to read as follows:

§ 121.309 Emergency equipment.

* * * * *

(f) * * *

(3) Three megaphones in the passenger cabin on each airplane with a seating capacity of more than 199 passengers, one installed at the forward end, one installed at the most rearward location, and one in the mid-section of the airplane. These megaphones must be readily accessible to a required flight attendant seat.

Explanation. This proposal increases the number of portable battery-powered megaphones accessible to flight attendants on passenger-carrying airplanes with a seating capacity of more than 199 passengers from two to three. The present rule requires one megaphone for airplanes with a seating capacity of 60-99 passengers and two for airplanes with a seating capacity of more the 99 passengers. When two megaphones re required, they must be located at the forward and rearward extremes of the airplane. With the increased size of modern passenger airplanes, emergency information transmitted over megaphones located at the two extremes of the airplane may not be audible to passengers near the middle. Thus, for airplanes with a seating capacity of more than 199 passengers, a third, mid-fuselage megaphone is proposed.

This proposal would also revise §§ 121.309(f)(1) and (f)(2) to require the megaphones to be readily accessible from a required flight attendant seat. Because "required" flight attendant seats are normally occupied during takeoff and landing, this will ensure that the megaphone is normally at an occupied seat for all passenger seating configurations. An other than required flight attendant seat may not be occupied on all flights.

Ref. Proposal 428; § 121.309; Committee 1; Agenda Item C-2.

11-7. By revising § 121.318(b)(4) and adding a new (b)(5) to read as follows:

§ 121.318 Public address system.

* * * * *

(b) * * *

(4) After (a date 2 years after the effective date of this amendment), transmission must be audible in each occupiable compartment, at each passenger and flight attendant seat, and in each lavatory.

(5) After (a date 2 years after the effective date of this amendment), it must be capable of operation from a power source independent of the main electrical generating system, without jeopardizing the inflight emergency electrical power system.

Explanation. The proposal to revise paragraph (b)(4) provides public address capability in all occupiable compartments, including lower lobe galleys when installed. This revision would ensure that flight attendants who may be in the lower lobe galley spaces receive information disseminated by way of the public address system to enable them to perform their safety functions more effectively. The FAA estimates that a 2-year compliance time is necessary for § 121.318(b)(4) since many operating airplanes do not have public address system speakers in each occupiable compartment or in each lavatory. This allows sufficient time for design, manufacture, and installation of the equipment. Specific comments on the appropriateness of the time period, including the number of airplanes affected and the costs involved, are requested when commenting on this proposal.

Proposed § 121.318(b)(5) requires power to be supplied to the public address system from a power source independent of the main electrical generating system. Currently, the only type of emergency evacuation communications equipment required is the portable megaphone required by § 121.309. The National Transportation Safety Board's Special Study, NTSB-AAS-74-3, "Safety Aspects of Emergency Evacuations from Air Carrier Aircraft", revealed that although the regulations do not require public address systems for emergency communications, these systems are often used to instruct the crew to initiate emergency evacuations. However, since the public address systems are not always connected to the emergency electrical supply, they are not always usable when the aircraft power is interrupted. There have been several incidents where the pilot aborted the takeoff and stopped. All switches were shut off and the flight crew could not readily order an emergency evacuation because no electrical power was available to the public address system. Also, there has been an accident caused by the failure in flight of all four engines due to fuel depletion. The flight crew's ability to give preimpact warning and instruction was hampered because the aircraft's public address system lost power when the engines stopped operating. Reliable communication is important to initiate and direct an evacuation or give preimpact instructions; thus, the power source for the public address system should be independent of the main supply.

The FAA anticipates that, to make the operation of the public address system independent of the main electrical generating system, system redesign and development is required, in addition to an airplane retrofit program. There are more than 3,250 airplanes operated under Part 121 which will likely require retrofit of the revised system. After careful consideration of the system redesign and development needed, the costs and time involved in retrofitting 3,250 airplanes, and other factors, the FAA concludes that two years is needed to comply with the requirement after it becomes effective. The FAA requests that specific comments and data supporting or opposing this time period, and the costs involved, be submitted in response to this notice.

Ref. Proposals 432 and 433; § 121.318; Committee 1; Agenda Item C-3.

APPENDIX C

MINIMUM EQUIPMENT LISTS FOR VARIOUS AIRCRAFT

DC-8 Master Minimum Equipment List Pertaining to Public Address System

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
MINIMUM EQUIPMENT LIST

Reports Identification Symbol
FS 8430-11

AIRCRAFT:	REVISION NO.	PAGE
Douglas DC-8 (All Models)	30	23-1
	DATE: April 4, 1978	

SYSTEM & SEQUENCE NUMBERS / ITEM	1. REQUIRED FOR ALL FLIGHT CONDITIONS EXCEPT AS PROVIDED IN COLUMN 2	2. REMARKS AND OR EXCEPTIONS
23 COMMUNICATIONS		
-1 Flight Deck Speakers (if installed)	-	* May be inoperative provided procedures are not predicated on their use.
-2 Public Address System	1	*# May be inoperative provided: (1) It is not required for emergency procedures, or (2) Alternate normal and emergency procedures and/or operating restrictions established and utilized, (3) Cabin attendant's interphone system is operative.
-3 VHF Communications Transmitters and Receivers	-	*# As required by FAR's, or o One transmitter and two independent communications receivers required for all operations. o One of the required receivers may be a VHF navigation receiver provided: a. If Number 1 (Captain's) transmitter or receiver is inoperative, the flight shall be restricted to VFR meteorological conditions, and b. The aircraft may not depart an airport where repairs or replacements can be made, and c. Aircraft must be repaired within 24 elapsed hours from time of the radio failure.

FAA Form 8430-7 (10-68)

APPENDIX C

L-1011 Master Minimum Equipment List Pertaining to Public Address System

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

MINIMUM EQUIPMENT LIST

Reports Symbol FS 8430-11

AIRCRAFT:	REVISION NO	DATE
Lockheed L-1011 (All Models)	11	23-1
	DATE: June 21, 1979	

SYSTEM & SEQUENCE NUMBERS	ITEM	1. REQUIRED FOR ALL FLIGHT CONDITIONS EXCEPT AS PROVIDED IN COLUMN 2	2. REMARKS AND OR EXCEPTIONS
23	COMMUNICATIONS		
-11-00	HF System	-	* As required by FAR.
-22-00	Selcal System	O	*
-23-00	VHF Communications Transmitters and Receivers	-	* As required by FAR, or *(OM) One transmitter and two independent communications receivers required for all operations. One of the required receivers may be a VHF navigation receiver provided: (a) If the transmitter/receiver system powered by the battery system (following loss of the electrical generator system) is inoperative, the flight shall be restricted to VFR (VMC) meteorological conditions. (b) The aircraft shall not depart an airport where repairs or replacements can be made, and (c) Aircraft must be repaired within 24 elapsed hours from the time of radio failure.
-31-00	PA System	-	*(O) May be inoperative provided: • Alternate normal and emergency procedures and/or operating restrictions are established and utilized. • Cabin interphone system is operative between the flight station and at least one attendant's station in each cabin zone, and (if applicable) the Tower galley. (See 23-41-04)

FAA Form 8430-7 (10-80)

APPENDIX C

DC-9 Master Minimum Equipment List Pertaining to Public Address System

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
MINIMUM EQUIPMENT LIST

Report Identification Symbol
FS 640C-11

AIRCRAFT: Douglas DC-9 (All Models)

REVISION NO. 13

DATE: August 18, 1977

SYSTEM & SEQUENCE NUMBERS	ITEM	1 REQUIRED FOR ALL FLIGHT CONDITIONS EXCEPT AS PROVIDED IN COLUMN 3	2 REMARKS AND OR EXCEPTIONS
23	COMMUNICATIONS		
-1	Audio Selector Control	2	One required at each occupied flight crew position.
-2	Integral Amp and Volume Control Loudspeaker	0	*
-3	Dynamic Interphone Microphone	-	One required at each occupied flight crew position.
-4	Oxygen (Smoke) Mask Microphone	-	One required at each occupied flight crew position.
-5	Headset, PL-55 Plug, Interphone	-	One required at each occupied flight crew position.
-6	Public Address System	1	*# May be inoperative provided: (1) It is not required for emergency procedures, or (2) Alternate normal and emergency procedures and/or operating restrictions established and utilized. (3) Cabin attendant's interphone system is operative.
-7	Flight Interphone System	1	

FAA Form 8430-7 (10-69)

APPENDIX C

DC-10 Master Minimum Equipment List Pertaining to Public Address System

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

MINIMUM EQUIPMENT LIST

Reports Identification Symbol
FS 8430-11

AIRCRAFT:	REVISION NO.	PAGE
Douglas DC-10 (All Models)	11	23-1
	DATE: November 6, 1978	

SYSTEM & SEQUENCE NUMBERS	ITEM	1. REQUIRED FOR ALL FLIGHT CONDITIONS EXCEPT AS PROVIDED IN COLUMN 2	2. REMARKS AND OR EXCEPTIONS
23	**COMMUNICATIONS**		
-1	HF Transceiver (If Installed)	2	As required by FAR.
-2	VHF Transceiver	-	*B(o)(m) As required by FAR; or One transmitter and two independent communications receivers required for all operations. One of the required receivers may be a VHF navigation receiver provided: a. If Number 1 (Captain's) transmitter or receiver is inoperative, the flight shall be restricted to VFR meteorological conditions, and b. The aircraft shall not depart an airport where repairs or replacements can be made, and c. Aircraft must be repaired within 24 elapsed hours from time of the radio failure.
-3	SELCAL	0	*
-4	Passenger Address System (See Items 23-8 and 23-9)	1	*B(o) May be inoperative provided: It is not required for emergency procedures, or (1) Alternate normal and emergency procedures and/or operating restrictions are established and utilized.

Continued on next page

FAA Form 8430-7 (10-68)

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

MINIMUM EQUIPMENT LIST

Reports Identification Symbol
FS 8430-11

AIRCRAFT:	REVISION NO 11	PAGE
Douglas DC-10 (All Models)	DATE: November 6, 1978	23-2

SYSTEM & SEQUENCE NUMBERS	ITEM	1. REQUIRED FOR ALL FLIGHT CONDITIONS EXCEPT AS PROVIDED IN COLUMN 2	2. REMARKS AND OR EXCEPTIONS
23	COMMUNICATIONS (Cont'd)		(2) Left or right cabin handsets are operative at the forward, mid, overwing and aft attendant stations. (3) Service Interphone System is operative.
-5	Passenger Music/Record Announce System	0	*
-6	Passenger Entertainment/ Service Multiplex System	0	— Demultiplexer Encoders must be installed to provide wiring connections for passenger oxygen door latch operation.
-7	Megaphones	-	* In the event a megaphone is malfunctioning, inoperative, or missing, the airplane may continue the flight or series of flights, but shall not depart an airport where repairs or replacements can be made.
-8	Service Interphone System (Cabin & Galley to Cockpit) (Cockpit to Cabin and Galley) (Maintenance Outlets) (See Item 23-4)	1	* Cabin to cockpit/cockpit to cabin function may be inoperative provided the announce mode of the PA system is operative and flight compartment PA speaker can be understood. Maintenance outlets may be inoperative provided maintenance interphone system switch is placed in OFF position.

FAA Form 8430-7 (10-69)

APPENDIX C

Boeing 707/720 Master Minimum Equipment List Pertaining to Public Address System

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
MINIMUM EQUIPMENT LIST

Reports Identification Symbol
FS 8430-11

AIRCRAFT:	REVISION NO.	PAGE
BOEING 707/720	35	23-2
	DATE: JUN 25 1980	

SYSTEM & SEQUENCE NUMBERS	ITEM	1. REQUIRED FOR ALL FLIGHT CONDITIONS EXCEPT AS PROVIDED IN COLUMN 2	2. REMARKS AND OR EXCEPTIONS
23	COMMUNICATIONS	Cont'd	
-6	Public Address System	1	*/ May be inoperative provided: (a) Alternate normal, and emergency procedures and/or operating procedures are established and utilized. (b) Cabin attendant's interphone system is operative. Not required for all-cargo operations.
-7	Flight Deck Interphone System		Required for all crew members on flight deck duty.
-8	Audio Selector Panel	-	* Pilot's and copilot's required for all operations. Others may be inoperative provided interphone system available to all flight deck stations required for a specific flight.
-9	Voice Recorder System	1	* In the event of malfunctioning or failure of the voice recorder system, the airplane may continue the flight or series of flights, but shall not depart an airport where repairs or replacements can be made.
-10	HF Communications Transmitters and Receivers	-	*/ As required by FAR.

FAA Form 8430-7 (10-68)

FAA AC 70-6B31

Boeing 727 Master Minimum Equipment List Pertaining to Public Address System

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
MINIMUM EQUIPMENT LIST

Reverse Identification Symbol
FS 8430-11

AIRCRAFT:	REVISION NO.	PAGE
BOEING 727	24	23-1
	DATE: DEC 4 1979	

SYSTEM & SEQUENCE NUMBERS	ITEM	1. REQUIRED FOR ALL FLIGHT CONDITIONS EXCEPT AS PROVIDED IN COLUMN 2	2. REMARKS AND OR EXCEPTIONS
23	**COMMUNICATIONS**		
-1	Flight Deck Speaker System (If Installed)	-	* May be inoperative provided procedures are not predicated on their use and headsets are installed and operative.
-2	Public Address System	1	*# May be inoperative provided: (a) Alternate normal and emergency procedures and/or operating restrictions are established and utilized. (b) Cabin attendant's interphone system is operative. Not required for all-cargo operations.
-3	VHF Communications Transmitters and Receivers	-	* As required by FAR. OR *# One transmitter and two independent communications receivers required for all operations. One of the required receivers may be a VHF navigation receiver provided: (a) If the transmitter/receiver system powered by the battery system (following loss of the electrical generator system) is inoperative, the flight shall be restricted to VFR (VMC) meteorological conditions. (b) The aircraft shall not depart an airport where repairs or replacements can be made, and (c) Aircraft must be repaired within 24 elapsed hours from the time of radio failure
-4	Flight Deck Interphone	1	Required for all crew members on flight deck duty.
-5	Audio Selector Panels	-	* Pilot's and copilot's required for all operations. Others may be inoperative provided interphone system is available to all flight deck stations required for a specific flight.

FAA Form 8430-7 (10-80)

FAA AC 70-0031

APPENDIX C

Boeing 747 Master Minimum Equipment List Pertaining to Public Address System

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
MINIMUM EQUIPMENT LIST

Report Identification Symbol
FS 8430-12

AIRCRAFT:	REVISION NO.	PAGE
BOEING 747	15	23-1
	DATE: JUN 15 1979	

SYSTEM & SEQUENCE NUMBERS	ITEM	1 REQUIRED FOR ALL FLIGHT CONDITIONS EXCEPT AS PROVIDED IN COLUMN 2	2 REMARKS AND OR EXCEPTIONS
23	COMMUNICATIONS		
-1	Flight Deck Speaker (If Installed)	-	* May be inoperative provided procedures are not predicated on their use and headsets are installed and operative.
-2	Public Address System	1	*# May be inoperative provided: (a) Alternate normal and emergency procedures and/or operating restrictions are established and utilized. (b) Cabin attendant's interphone system is fully operative. Not required for all-cargo operations.
-3	VHF Communications Transmitters and Receivers	-	*# As required by FAR. OR *# One transmitter and two independent receivers required for all operations. One of the required receivers may be a VHF navigation receiver provided: (a) If the transmitter/receiver system powered by the battery system (following loss of the electrical generator system) is inoperative, the flight shall be restricted to VFR (VMC) meteorological conditions. (b) The aircraft shall not depart an airport where repairs or replacements can be made, and (c) Aircraft must be repaired within 24 elapsed hours from the time of radio failure.
-4	Flight Deck Interphone System	1	Required for all crewmembers on flight deck duty.
-5	Audio Selector Panels	-	* Pilot's and copilot's required for all operations. Others may be inoperative provided interphone system available to all flight deck stations required for a specific flight.

FAA Form 8430-7 (10-68)

FAA AC 70-8231

*U.S. GOVERNMENT PRINTING OFFICE: 1981-0-361-928/72

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DATE

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